

SUB C.7

B9
cont
ppm, and

wherein an amount of sodium contained within the wiring is equal to or less than 0.3

wherein an amount of oxygen contained within the wiring is equal to or less than 1

wt%.

B10
48. (Amended) A device according to claim 40, wherein the wiring is used as a gate electrode
of a TFT.

B11
52. (Twice Amended) A semiconductor device comprising:
a wiring formed over a substrate, the wiring comprising a tungsten nitride film and a
film comprising tungsten formed thereon,
wherein the wiring includes at least one inert element, and 90% or more of the inert
element is argon,
wherein an amount of sodium contained within the wiring is equal to or less than 0.3
ppm, and
wherein internal stress of the wiring comprising tungsten is from -1×10^{10} dyn/cm² to
 $+1 \times 10^{10}$ dyn/cm².

REMARKS

As Applicants are filing a RCE herewith, it is requested that this amendment now be entered.

Applicants will address each of the Examiner's objections and rejections in the order in which
they appear in the Final Rejection.

Drawings

The Examiner objects to the drawings under 37 CFR §1.83(a). In particular, the Examiner objects to Claims 4 and 40 and states that the drawings do not recite all of the features in these claims.

Applicants have amended Claims 4 and 40 herein. For example, Claim 4 requires:

“a wiring formed over a substrate, the wirings comprising a metal film and a nitride film of the metal film, the metal film located on the nitride film...”

Such a structure is clearly described in the specification at page 18, lns. 4-8 and shown in Fig. 2C.

Claim 40 requires:

“a wiring formed over a substrate, the wiring having a lamination structure containing a tungsten nitride film and a film comprising tungsten formed thereon...”

Such a structure is clearly described in the specification at page 18, lns. 4-13 and shown in Fig. 2C.

Hence, the claims are clearly supported by the drawings, and it is requested that this objection now be withdrawn.

Claim Rejections - 35 USC §102, 103

In the Final Rejection, the Examiner also has the following rejections:

1. Claims 1 and 2 are rejected under 35 USC §102(b) as being anticipated by Oikawa et al.
2. Claims 3 and 52 are rejected under 35 USC §103 as being unpatentable over Oikawa et al.
3. Claims 4, 6-8, 9-11, 13-15, 16, 18-28, 30-35, 37-40, 42-47 and 49-51 are rejected under 35 USC §103 as being unpatentable over Oikawa et al. in view of Prall et al.

4. Claims 5, 12, 17, 29, 36, 41 and 48 are rejected under 35 USC §103 as being unpatentable over Oikawa et al. in view of Prall et al. and further in view of Ikeda et al.

5. Claim 1-3 and 52 are rejected under 35 USC §103 as being unpatentable over Ikeda et al. in view of Oikawa et al.

6. Claims 4-51 are rejected under 35 USC §103 as being unpatentable over Ikeda et al. in view of Oikawa et al. and further in view of Prall et al.

Each of these rejections is respectfully traversed.

Independent Claim 1 of the present application, as amended, is directed to a semiconductor device comprising a wiring formed over a substrate, the wiring comprising a tungsten nitride film and a tungsten film formed thereon, wherein the wiring includes at least one inert element, and 90% or more of the inert element is argon, and wherein an amount of sodium contained within the wiring is equal to or less than 0.3 ppm. This is clearly described in the specification on page 18, ln. 4 to page 19, ln. 18.

Applicants believe that at the very least the feature of a wiring comprising a tungsten nitride film and a tungsten film formed thereon, as recited in amended Claim 1, is a distinguishable feature over the cited references.

For similar reasons, Applicants believe that the other independent claims would also be patentable over the cited references.

Accordingly, it is requested that these rejections be withdrawn.

Preliminary Amendment A

On July 27, 2000, Applicants filed Preliminary Amendment A making minor amendments to Figs. 30 and 31. Applicants request that the Examiner acknowledge receipt and entrance of this

Preliminary Amendment A

On July 27, 2000, Applicants filed Preliminary Amendment A making minor amendments to Figs. 30 and 31. Applicants request that the Examiner acknowledge receipt and entrance of this amendment.

Conclusion

It is respectfully submitted that the present application is now in a condition for allowance and should be allowed.

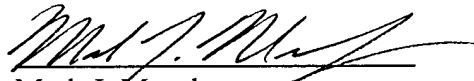
If any further fee should be due for this Amendment, please charge our deposit account 50/1039.

Favorable reconsideration is earnestly solicited.

Respectfully submitted,

Date:

January 17, 2003


Mark J. Murphy
Registration No. 34,225

COOK, ALEX, McFARRON, MANZO,
CUMMINGS & MEHLER, LTD.
200 West Adams Street
Suite 2850
Chicago, Illinois 60606
(312) 236-8500

Marked-up copy of the claims as amended:

IN THE CLAIMS:

Please amend the claims as follows:

1. (Twice Amended) A semiconductor device comprising:

a wiring[s] formed over a substrate, the wiring[s] comprising [tungsten or a tungsten compound as a main constituent] a tungsten nitride film and a tungsten film formed thereon,

wherein the wiring[s] include at least one inert element, and 90% or more of the inert element is argon, and

wherein an amount of sodium contained within the wiring[s] is equal to or less than 0.3 ppm.

2. (Amended) A [wiring material] device according to claim 1, wherein [the tungsten chemical compound is a chemical compound of: one element, or a plurality of elements, selected from the group consisting of Ta, Ti, Mo, Cr, Nb, and Si; and tungsten] a thickness of the tungsten nitride film is 10 to 50 nm and a thickness of the tungsten film is 200 to 400 nm.

3. (Twice Amended) A [wiring material] device according to claim 1, wherein electrical resistivity of the wiring[s] is equal to or less than 40 $\mu\Omega\cdot\text{cm}$.

4. (Twice Amended) A semiconductor device comprising:

[a metallic film] a wiring formed over a substrate, the [metallic film] wirings comprising [one element, or a plurality of elements, selected from the group consisting of W, Ta, Ti, Mo, Cr, Nb, and Si; a metallic compound film having said elements as main constituents; an alloy film

of a combination of said elements; or a lamination film of thin films selected from the group consisting of said metallic film, said metallic compound film, and said alloy film] a metal film and a nitride film of the metal film, the metal film located on the nitride film,

wherein the [metallic film] wiring includes at least one inert element and[,] 90% or more of the inert element is argon, and

wherein an amount of sodium contained within the [metallic film] wiring is equal to or less than 0.3 ppm.

5. (Twice Amended) A device according to claim 4, further comprising a semiconductor film adjacent to the [metallic film] wiring with an insulating film interposed therebetween.

6. (Twice Amended) A device according to claim 4, wherein the inert element except for argon is contained within the [metallic film] wiring at an amount equal to or less than 1 atom%.

7. (Twice Amended) A device according to claim 4, wherein the inert element except for argon is contained within the [metallic film] wiring at an amount equal to or less than 0.1 atom%.

9. (Twice Amended) A device according to claim 4, wherein internal stress of the [metallic film] wiring is from -1×10^{10} dyn/cm² to $+1 \times 10^{10}$ dyn/cm².

10. (Twice Amended) A device according to claim 4, wherein line width of the [metallic film] wiring is equal to or less than 5 μ m.

11. (Twice Amended) A device according to claim 4, wherein film thickness of the [metallic film] wiring is equal to or greater than 0.1 μm , and equal to or less than 0.7 μm .

12. (Twice Amended) A device according to claim 4, wherein the [metallic film] wiring is used as a gate [wiring] electrode of a TFT.

13. (Twice Amended) A device according to claim 4, wherein resistance value per 1 square μm of surface area of a connection between the [metallic film] wiring and an aluminum wiring is equal to or less than 40 Ω .

16. (Twice Amended) A semiconductor device comprising:

a [film formed over a substrate, the film comprising tungsten or a tungsten compound as a main constituent] wiring formed over a substrate, the wiring comprising a tungsten nitride film and a tungsten film formed thereon; and

an insulating film formed over the [film] wiring, said insulating film comprising SiO_xN_y ,

wherein the [film] wiring includes at least one inert element[,] and 90% or more of the inert element is argon, and

wherein an amount of sodium contained within the [film] wiring is equal to or less than 0.3 ppm.

17. (Twice Amended) A device according to claim 16, further comprising a semiconductor film adjacent to the [film comprising tungsten] wiring with an insulating film interposed therebetween.

18. (Twice Amended) A device according to claim 16, wherein the inert element except for argon is contained within the [film] wiring at an amount equal to or less than 1 atom%.

19. (Twice Amended) A device according to claim 16, wherein the inert element except for argon is contained within the [film] wiring at an amount equal to or less than 0.1 atom%.

21. (Twice Amended) A device according to claim 16, wherein internal stress of the tungsten film or of the [film] wiring [comprising the tungsten compound as its main constituent] is from -1×10^{10} dyn/cm² to $+1 \times 10^{10}$ dyn/cm².

22. (Twice Amended) A device according to claim 16, wherein line width of the [film] wiring is equal to or less than 5 μm .

23. (Twice Amended) A device according to claim , wherein film thickness of the [film] wiring is equal to or greater than 0.1 μm , and equal to or less than 0.7 μm .

24. (Twice Amended) A device according to claim 16, wherein the [film] wiring is used as a gate [wiring] electrode of a TFT.

25. (Twice Amended) A device according to claim 16, wherein resistance value per 1 square μm of surface area of a connection between the [film] wiring and an aluminum wiring is equal to or less than 40 Ω .

28. (Twice Amended) A semiconductor device comprising:

a wiring formed over a substrate having a lamination structure comprising a phosphorus doped silicon, a nitride film of tungsten, and a film comprising tungsten [or a tungsten compound as a main constituent, and a nitride film of tungsten],

wherein the film comprising tungsten includes at least one inert element, and 90% or more of the inert element is argon, and

wherein an amount of sodium contained within the wiring is equal to or less than 0.3 ppm.

36. (Amended) A device according to claim 28, wherein the wiring is used as a gate [wiring] electrode of a TFT.

40. (Twice Amended) A semiconductor device comprising:

a wiring formed over a substrate, the wiring having a lamination structure containing [a silicon film having an added impurity element for imparting conductivity, a film comprising tungsten or a tungsten compound as a main constituent, and a nitride film of tungsten] a tungsten nitride film and a film comprising tungsten formed thereon,

wherein the film comprising tungsten includes at least one inert element, and 90% or more of the inert element is argon, [and]

wherein an amount of sodium contained within the wiring is equal to or less than 0.3 ppm, and

wherein an amount of oxygen contained within the wiring is equal to or less than 1 wt%.

48. (Amended) A device according to claim 40, wherein the wiring is used as a gate [wiring] electrode of a TFT.

52. (Twice Amended) A semiconductor device comprising:

a wiring [comprising tungsten] formed over a substrate, the wiring comprising a tungsten nitride film and a film comprising tungsten formed thereon,

wherein the wiring includes at least one inert element, and 90% or more of the inert element is argon,

wherein an amount of sodium contained within the wiring is equal to or less than 0.3 ppm, and

wherein internal stress of the wiring comprising tungsten is from -1×10^{10} dyn/cm² to $+1 \times 10^{10}$ dyn/cm².